CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

For most of us, corrosion is defined as the destruction or deterioration of a metal because of reaction with environment that is often called rust and is a curse we have to endure helplessly. Corrosion is electrochemical processes in which a current leaves a structure at the anode site, passes through an electrolyte, and reenters the structure at the cathode site. Differences in potential at different points along the pipe begin to develop. For example, because it is in a soil with low resistivity compared to the rest of the line, current would leave the pipeline at that anode site, pass through the soil, and reenter the pipeline at a cathode site. These potentials generate corrosion currents which leave the pipe to enter the soil at certain selective locations. Corrosion then occurs at these selective locations of the pipe structure. Internal or external corrosion of underground pipelines in soil or water results in selective and concentrated attacks at coating defects. There is no need to replace a complete piece of pipe if corrosion can be controlled at these selective locations (Gibala, R., Tireell, M., and Wert, C., 1993).

Corrosion is a very serious problem. Three areas in which corrosion are important are in economic, improved safety and conservation of resources. The leakage

of hazardous materials from a transport pipeline represents not only the loss of natural resources but also the potential for serious and dangerous environmental impact, and human fatalities. While pipelines are designed and constructed to maintain their integrity, diverse factors (e.g., corrosion) make it difficult to avoid the occurrence of leakage in a pipeline system during its lifetime.On the other hand, internal pipeline events that increase the risk of failure include the generation of defects due to corrosion or erosion and fatigue due to fluctuating pressure or temperature conditions. Although the transmission pipeline safety record has been improving over time, and human casualties, property loss, and environmental damage resulting from pipeline incidents are infrequent, when they do occur the consequences can be significant. For example, a 1999 liquids pipeline incident in Bellingham, Washington, resulted in the release of 277,000 gallons of gasoline into a stream in the middle of the city (Pipeline Rupture and Subsequent Fire 1999, Pipeline Accident Report. 2002 Washington). The gasoline ignited, killing three, injuring eight,and causing.

To solve this problem, cathodic protection which is sacrifial anode provides a valuable extra precaution against corrosion attack. This method only required simple installation which is anodes made from electrically dissimilar metals are buried in the ground near the pipeline, which acts as the anode, and the corrosive action of ground water is thereby arrested, the anodes being sacrificially consumed (British standard code of practice Cathodic Protection. 1973).To protect the pipeline from corrosion with effectively we must have good knowledge in corrosion.

By following the useable concept of the corrosion mechanism, it easier to understand various conditions to be described which cause active corrosion cells on pipeline. The corrosion process as normally encountered in pipeline work is basically electrochemical in nature and that the presence of oxygen in some form is necessary. The amount of metal that will be removed is directly proportional to the amount of current flow. After we applied the cathodic protection by using sacrificial anode to the underground steel pipe, the general result is the original anode (steel pipe) became as

cathode and some other metal for example alluminium will became anode (National Research Council. 1988. Washington DC).

1.2 PROBLEM STATEMENT

Corrosion of underground steel pipeline is as a result of an electrochemical reaction. Corrosion is an electrochemical process in which a current leaves a structure at the anode site, passes through an electrolyte, and reenters the structure at the cathodesite areas which corrosion is important is in economic , safety , and conservation of resources. sacrificial anode were used to prevent or to longer the time of corrosion of the underground pipeline metals, unfortunately the harmful chemicals such a mercury were added and it will cause the polutions to the living things.

Cathodic protection is the most important of all approaches to corrosion control.One of the types of cathodic protection is sacrificial anode. Corrosion occurs through the loss of the metal ions at anodic area to the electrolyte. Cathodic areas are protected from corrosion because of the deposition of hydrogen or other ions that carry current (Sandoval, A., Beruvides, M., Wiesner, T.F.2001). By using the sacrificial anode technique the steel pipe will protected from corrosion but other metal that we used will be corrode. In designing this method we must analyze parameters such as factor affecting corrosion, the amount of anode and rate of corrosion.

1.3 OBJECTIVES OF STUDY

The objectives of this study are:

i. To design the best performance of sacrifial anode without using any harmful chemical.
ii. To increase the reactivity and electrical potential of sacrifial anode.